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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/733,280	12/08/2000	Masaki Hara	09792909-4724	3148

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SONNENSCHN NATH & ROSENTHAL
80th Floor-Sears Tower
233 S. Wacker Drive
Chicago, IL 60606

EXAMINER

TRAN, BINH X

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 12/04/2002

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	09/733,280		HARA, MASAKI	
	Examiner		Art Unit	
	Binh X Tran		1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 December 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 8-9, 24-25 was rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In claims 8-9, 24-25, the examiner cannot find the support for the limitation "maintaining said wafer stage at a temperature not lower than the melting point of said conductor" (emphasis added). The examiner recognizes that the applicants describe the step of "maintaining the wafer stage at a temperature above the melting point of the conductor" (in page 8 lines 5-6). However the examiner interprets the limitation "not lower than" as a negative limitation. The phrase "not lower than" means greater than or equal. The phrase "not lower than" in the specification is not equivalent or identical with the term "above" in the claim. Further negative limitation must be positively supported by the specification.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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4. Claims 1-3, 5, 7-9, 18-19, 21, 23-24, 25 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1 and 17, "etching an object to be etched" is redundant, vague and indefinite.

In claim 1 and 17, "major surfaces" (emphasis added) is subjective and indefinite.

In lines 6 of claim 1, "said entity" lacks antecedent basis.

In line 2 of claim 7, line 3 of claim 8, line 3 of claim 23 and line 3 of claim 24 "low melting point" (emphasis added) is subjective, vague and indefinite.

In line 3 of claim 9 and line 3 of claim 25 "high melting point" is subjective, vague and indefinite.

In claim 17, "said entity" is vague because it lacks antecedent basis.

In claim 24, "on a location of said other surface" is vague because it is unclear what "other surface" applicants wish to refer.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-4, 6-7, 11-12, 17-20, 22-23, 27-28 are rejected under 35 U.S.C. 102(b) as being anticipated by Murthy et al. (US 5,658,471).

Respect to claim 1 and 17, Murthy discloses a method to make a through hole comprising:

performing a dry etching to form a through hole (20, Fig 1D-1G, or 38 of Fig 4A-4G) under the condition where a conductor (28 and 30) (i.e., aluminum or Al/Cu alloy, col. 7 lines 9-15 and/or col. 9 lines 8-11) is in contact with the wafer at least near a location for making a through hole (read on "in contact with said entity at least in or near a location for making said through hole", See Fig 1D-1G, or Fig 4A-4G).

Murthy does not explicitly disclose that the conductor has a "higher electric conductivity than that of said entity". However, Murthy clearly disclose the conductor is aluminum and/or Al/Cu and the entity is the silicon substrate. It is well known in the art that the aluminum and/or Al/Cu must have a higher electric conductivity than silicon because aluminum and/or Al/Cu is a conductor whether silicon is a semiconductor material. Further the electric conductivity is the property of the material itself. A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure (i.e. conductor vs. semiconductor), the properties applicant discloses and/or claims are necessarily present.

Respect to claims 2-3, 18-19 Murthy discloses that substrate to be etched is made of silicon (read on "semiconductor", col. 5 lines 55-60). Respect to claims 4 and 20, Murthy discloses the conductor is aluminum (read on "metal", col. 9 lines 8-10). Respect to claim 6, Murthy discloses the conductor (28, 30) is a conductor film formed on the 2nd surface of the silicon wafer near the region for making the through hole (Fig 1D-1G, Fig 4C-4D). Respect to claims 7 and 23, the limitation of "low melting" is

subjective and indefinite (See 112 Rejection in previous paragraphs). Further since Murthy discloses the same material for the metal conductor layer with the applicants, any melting point the applicants claim will anticipate by the prior art because melting point is the property of the material itself. Respects to claims 11-12, 27-28, Murthy discloses the dry etching is reactive ion etching (RIE) (col. 7 lines 20-39).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 5 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murthy in view of Taub (US 5,308,442).

Murthy does not disclose the conductor is formed on the entire surface of the other surface of the entity to be etched. However, Murthy clearly disclose that the conductor is formed on the 2nd surface (i.e. other surface) of the entity to be etched. Taub disclose that the conductor is formed on the entire surface and then patterned so that it appears only on the portion of the surface (col. 5 line 63 to col. 6 line 2). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Murthy in view of Taub by forming the conductor on the entire surface because it is much easier to form a layer on the entire surface and then patterned it to a specific shape than to deposit a layer to the specific shape.

9. Claims 13-16, 29-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murthy in view of Yamashita (US 6,150,280).

Murthy does not explicitly disclose the specific value of the aspect ratio. In a method for forming through hole, Yamashita discloses the aspect ratio at 20 (read on not smaller than 3 or 5 or 8 or 10; col. 2 lines 25-32). Yamashita further discloses the aspect ratio is the result effective variable base on the depth and the width of the hole. It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Murthy in view of Yamashita by having the aspect ratio not smaller than 10 because Murthy is not particular about the specific value of the aspect ratio and therefore any value would produce an expected result. Further, since aspect ratio is a result effective variable and result effective variable is determined by routine experiment. The process of conducting routine optimization experiments so as to produce an expected result is obvious to one of ordinary skill in the art.

10. Claims 10 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murthy in view of Floyd (US 6,014,240).

Murthy fails to disclose the dry etching is conducted using SF₆ and C₄F₈ gas. However, Murthy clearly disclose the dry etching is performed using SF₆, CF₄. Floyd disclose the dry etching is performed using SF₆ and C₄F₈ (col. 5 lines 38-45). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Murthy in view of Floyd by using SF₆ and C₄F₈ because equivalent and substitution of one for the other would produce an expected result.

Conclusion


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11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X Tran whose telephone number is (703) 308-1867. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on (703) 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Binh X. Tran
November 26, 2002


ROBERT KUNEMUND
PRIMARY EXAMINER